Attraction of *Pissodes affinis* and *P. fasciatus* (Coleoptera: Curculionidae) to pityol and α-pinene in a coastal stand of western white pine and Douglas-fir

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ABSTRACT

Lindgren multiple-funnel traps, baited with (-)-α-pinene and (±)-pityol, captured significant numbers of the weevils, *Pissodes affinis* Randall and *P. fasciatus* LeConte, in a coastal stand of Douglas-fir and western white pine.

Key words: *Pissodes*, Coleoptera, Curculionidae, pityol, Lindgren funnel trap

DISCUSSION

During a 3-week period in early summer of 1997, 22 *Pissodes affinis* Randall and 16 *P. fasciatus* (LeConte) (Coleoptera: Curculionidae) were captured in one Lindgren 12-unit multiple-funnel trap (Lindgren 1983), baited with (-)-α-pinene and (±)-pityol, (2*R*, 5*S*)-2-[1-hydroxyl-1-methylethyl]-5-methyl-tetrahydrofuran. Eight additional funnel traps baited with (-)-α-pinene and ethanol, or ethanol alone, did not capture any weevils. The traps, located near ground level within a 25-30-year-old stand on Texada Island, British Columbia, were extraneous to a trapping study on the attraction of the ponderosa pine cone beetle, *Conophthorus ponderosae* Hopkins (Coleoptera: Scolytidae), to the sex pheromone (±)-pityol in the crowns of western white pine, *Pinus monticola* Dougl. ex D. Don (published elsewhere). The sole purpose of the nine Lindgren funnel traps was to collect a sample of various species of beetles that occur within a stand dominated by western white pine and coastal Douglas-fir, *Pseudotsuga menziesii* var. *menziesii* (Mirb.) Franco. The lack of replication in the serendipitous capture of a significant number of weevils necessitated additional research in order to assuage concerns that the result was due solely to random chance, prior to directing a comprehensive effort on the chemical ecology of these two species. Therefore, in 1998 we attempted to verify the attraction of *P. affinis* and *P. fasciatus* to Lindgren multiple-funnel traps baited with (-)-α-pinene and (±)-pityol.

Twenty 12-unit Lindgren multiple-funnel traps (Phero Tech Inc., Delta BC) were set in the same Texada Island study area used in 1997. The 12-ha stand is a seed production area for western white pine resistant to white pine blister rust, *Cronartium ribicola* J.C. Fisch. The mean (± SE) height and diameter (at breast height) of white pine trees were 21.5 (± 0.3) m and 31.3 (± 1.1) cm. Each trap was hung between two trees with twine such that the bottom of each trap was approximately 0.5 m above ground level as in 1997. No trap was within 2 m of any tree. Spacing between traps varied from 10-15 m. Each collection cup had a side-mounted screen for drainage and contained ca. 200 mL of plumber's antifreeze (a.i. propylene glycol).

Ten randomly-selected traps were baited with (±)-pityol (40 mg bubblecap lure) and (-)-α-pinene (15 mL polyethylene bottle) (Phero Tech Inc., Delta, British Columbia), both with chemical purities >98%. The release rates of (±)-pityol and (-)-α-pinene from lures were ca. 0.2 mg/d and 150 mg/d, respectively, at 24 °C. The remaining traps were not baited. Trapping commenced on 15 April with catches collected at intervals of 2-3 weeks until the traps were taken down on 20 August. Voucher specimens were deposited at the Entomology Museum, Pacific Forestry Centre (Victoria, British Columbia). Trap catch data were analyzed by *t*-test at the 5% probability level with the SYSTAT statistical package version 8.0 (SPSS 1998).

Both *Pissodes affinis* and *P. fasciatus* were attracted to traps baited with (-)-α-pinene and (±)-pityol; no weevils were captured in unbaited traps (Table 1). Most weevils (92%) were captured between 15 May and 31 July while none were caught during the last collection period (1-20 August). The total catch of 54 weevils in the stands in 1998 is consistent with the total catch of 38 weevils in 1997 although the mean trap catch of weevils was low.

Table 1

Total catches of *Pissodes affinis* and *P. fasciatus* to baited Lindgren multiple-funnel traps from 15 April to 20 August 1998 (n = 10).

	Mean (±SE) number of weevils[a]	
Species	Blank control	Pityol + α-pinene
Pissodes affinis	0.0 ± 0.0 a	3.1 ± 1.0 b
Pissodes fasciatus	0.0 ± 0.0 a	2.3 ± 0.5 b

[a] Means within the same row followed by a different letter are significantly different at $P<0.05$ (*t* test).

Low trap catches are not uncommon with *Pissodes* weevils. Mean catches to the popular sticky, cylindrical, mesh traps have ranged from 6-19 weevils/trap/season, sometimes higher depending on population levels and attractants (eg. Overhulser and Gara 1975; Fontaine and Foltz 1982; Booth *et al.* 1983; Phillips and Lanier 1986). Tunset *et al.* (1993) caught 9-12 *P. pini* (L.)/trap/season with window traps while Chénier and Philogène (1989a) caught ca. four *P. strobus* (Peck)/trap/season with similar traps; they caught less than one weevil/trap/season with the Lindgren multiple-funnel trap. Pitfall traps also catch low numbers of weevils (9-12/trap/season) (Nevill and Alexander 1992).

Pissodes affinis and *P. fasciatus* are root/bole weevils that feed on western white pine and Douglas-fir, respectively (Furniss and Carolin 1980). *Pissodes fasciatus* vectors black-stain root disease, *Leptographium wageneri* (Kendrick) M.J. Wingfield, in Douglas-fir (Witcosky and Hansen 1985; Witcosky *et al.* 1986; Jacobi 1992), a disease which causes significant mortality in young stands (15-30 yrs) (Hunt and Morrison 1995; Allen *et al.* 1996). An effective monitoring tool for these species would be useful in attempts to understand their possible impacts and opportunities for controls. Our results offer promise that an effective trapping tool can be developed for *P. fasciatus* and *P. affinis.*

Issues such as trap design and density, and optimal combinations of lures and release rates need to be resolved for *P. affinis* and *P. fasciatus.* Chénier and Philogène (1989a) found that sticky, stovepipe traps were significantly more effective in catching *P. strobus* and *Hylobius pales* (Herbst) than either window traps or Lindgren funnel traps. In Florida, Fatzinger (1985a) caught in excess of 12,000 weevils of various species with 21 traps consisting of wading pools and stovepipe cylinders. Various authors have demonstrated synergism between ethanol and monoterpenes in the attraction of weevils (Fatzinger 1985b; Tilles *et al.* 1986; Fatzinger *et al.* 1987; Chénier and Philogène 1989b; Hunt and Raffa 1989; Rieske and Raffa 1991). It is also possible that the propylene glycol used in collection jars acted as a synergist. Propylene glycol is a human food product and may represent a food source to weevils as well. Moreover, low catches of weevils in past trials using Lindgren multiple-funnel traps without a liquid preservative may have been a consequence of escapes by weevils due to their high level of agility, relative to other beetle species commonly captured in multiple-funnel traps.

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